Eocene volcanic rocks were mostly andesitic flows and breccias; the Miocene wholly andesitic or dacitic, stratified tuffs with coal; the Pliocene a succession of rhyolitic flows and breccias.

The description by one geologist of specimens collected by another at the Antipodes is a division of labour which has drawbacks as well as advantages. Prof. Sollas, however, has faced the difficulty successfully, and the large amount of labour which he has expended on this study has produced results which have a value by no means confined to New Zealand geology. Arising from the detailed examination of the rocks, there are a number of more general questions of petrographical interest on which the author is able to throw light. One point is the recognition in the ground-mass of the so-called "pilotaxitic" andesites of an interstitial mosaic of quartz, which plays the same part as the glassy base in the "hyalopilitic" type. Another point is the discovery of a certain isotropic hydrated decomposition-product, which partly or wholly replaces the felspar crystals in some of the rhyolites. This was taken by Rutley for glass, and regarded as evidence of the re-fusion of the rock. Our author finds no evidence of devitrification in the glassy rhyolites of this district, but there may be considerable chemical alteration. The Palæozoic dyke-rocks are also described and discussed. They range from quartz-diorite, through "dacite-porphyrite," to dacite, the second being given as a new name to a type of intermediate characters which agrees generally with propylite as defined by Zirkel. We may remark that the term "dacite-porphyry" has been used by American petrologists for a rock not essentially different (see, *e.g.*, Iddings in *Bull.* 150 *U.S. Geol. Sur.* [1898], p. 233).

The report under notice is marked "vol. i.," and we may expect that the geological and petrological study of the Cape Colville district will yield further results of interest. One question which remains to be elucidated is that of the mode of occurrence and origin of the gold. Comparison with the well known Comstock district of Nevada suggests that careful chemical assays of the rocks, both fresh and decomposed, would give significant information on this point. A. H.

## *INSECTS AS CARRIERS OF DISEASE.*[1]

"Infinite torment of flies."—*Tennyson.*

THE last few years are marked in the annals of medicine by a great increase in our knowledge of certain parasitic diseases, and, above all, in our knowledge of the agency by which the parasites causing the diseases are conveyed.

Chief among these agencies, in carrying the disease-causing organisms from infected to uninfected animals, are the insects, and, amongst the insects, above all the flies. Flies, *e.g.* the common house-fly (*Musca domestica*), can carry about with them the bacillus of anthrax. Flies, ants, and other even more objectionable insects, are not only capable of disseminating the plague-bacillus from man to man, and possibly from rat to man, but they themselves fall victims to the disease, and perish in great numbers. They are active agents in the spread of cholera, and the history of the late war in this country definitely shows that flies play a large part in carrying the bacilli of enteric fever from sources of infection to the food of man, thus spreading the disease.

The diseases already mentioned are caused by bacteria. But flies also play a part in the conveyance of a large number of organisms which are not bacteria, but which, nevertheless, cause disease.

In considering the part played by flies in disseminating diseases not caused by bacteria, we can neglect all but a very few families, those flies which suck blood having alone any interest in this connection.

From the point of view of the physician, by far the most important of these families is the Culicidæ, with more than 300 described species and 5 subfamilies, of which two, the Culicina and the Anophelina, interest us in relation to disease. The gnats or mosquitoes are amongst the most graceful and most beautiful insects that we know; but they have been judged by their works and undoubtedly are unpopular, and we shall see that this unpopularity is well deserved. Gnats belong both to the genus Culex and to the genus Anopheles. The genus Culex, from which the order takes its name, includes not only our commonest gnat, often seen in swarms on summer evenings, but some hundred and thirty other species. Members of this genus convey from man to man the *Filaria nocturna*, one of the causes of the widely-spread disease filariasis. In patients suffering from this disease, minute embryonic round-worms swarm in the blood-vessels of the skin during the hours of darkness. Between six and seven in the evening they begin to appear in the superficial blood-vessels, and they increase in number until midnight, when they may occur in such numbers that five or six hundred may be counted in a single drop of blood. After midnight, the swarms begin to lessen, and, by breakfast time, about eight or nine in the morning, except for a few strayed revellers, they have disappeared from the superficial circulations, and are hidden away in the larger blood-vessels and in the lungs.

In spite of their incredible number, some authorities place it at thirty to forty millions in one man, these minute larval organisms, shaped something like a needle pointed at each end, seem to cause little harm. It might be thought that they would traverse the walls of the blood-vessels, and cause trouble in the surrounding tissues; but this is prevented by a curious device. It is well known that, like insects, round-worms from time to time cast their skins, and the young larvæ in the blood cast theirs, but do not escape from the inside of this winding-sheet; and thus, though they actively wriggle and coil and uncoil their bodies, their progress is as small, and their struggles as little effective, as are those of a man in a strait-waistcoat.

One reason of the normal appearance of the creatures in the blood at night is undoubtedly connected with the habits of its second host, the gnat or mosquito. Two species are accused of carrying the Filaria from man to man—*Culex fatigans* and *Anopheles nigerrimus*. Sucked up with the blood, the round-worms pass into the stomach of the insect. Here they appear to become violently excited, and rush from one end to the other of their enveloping sheath, until they succeed in breaking through it. When free, they pierce the walls of the stomach of the mosquito, and come to rest in the great thoracic muscles. Here the Filarias rest for some two or three weeks, growing considerably and developing a mouth and an alimentary canal, thence, when they are sufficiently developed, they make their way to the proboscis of the mosquito. Here they lie in couples. Exactly how they effect their exit from the mosquito and their entrance into man has not yet been accurately observed; but presumably it is during the process of biting. Once inside man, they work their way to the lymphatics, and very soon the female begins to pour into the lymph a stream of young embryos, which reach the blood-vessels through the thoracic duct. It is, however, the adults which are the source of all the trouble. They are of considerable size, three or four inches in length; and their presence, by blocking the channels of the lymphatics, gives rise to a wide range of disease, of which elephantiasis is the most pronounced form.

We now pass to the second of the diseases carried by gnats, that of Malaria.

The parasite which causes malaria is a much more lowly organised animal than the Filaria. It is named Hæmamœba, and it too is conveyed by an insect, and, so far as we know, by one genus of mosquito only, the Anopheles. Hence from the point of view of malaria it is important to know whether a district is infected with Culex or Anopheles. The former is rather humpbacked and keeps its body parallel with the surface it is biting, and its larva hangs at an angle below the surface of the water by means of a respiratory tube. Anopheles, on the other hand, carries its body at a sharp angle with the surface upon which it rests, and its larva lies flat below the surface-film and parallel with it. The malarial parasite lives in the blood-cells of man, but at a certain period it breaks up into spores which escape into the fluid of the blood, and it is at this moment that the sufferer feels the access of fever. Their presence and growth within the blood-cells

[1] From an Address delivered before the British Association at Pretoria, by A. E. Shipley, F.R.S.

result in the destruction of the latter, a very serious thing to the patient if the organisms be at all numerous. If the spores be sucked up by an Anopheles, they undergo a complex change, and ultimately reproduce an incredible number of minute spores or sporozoites, each capable of infecting man again if it can but win entrance into his body.

In normal circumstances, for each Filaria larva which enters a mosquito one Filaria issues forth, longer, it is true, and more highly developed, but not much changed. The malaria-parasite undergoes, in its passage through the body of the Anopheles, many and varied phases of its life-history. As the Frenchman said of the pork, which goes into one end of the machine in the Chicago meat-factories as live pig, and comes out at the other in the form of sausages, "il est diablement changé en route."

Whoever has watched under a lens the process of "biting," as carried on by a mosquito, must have observed the fleshy proboscis (labium) terminating in a couple of lobes. The labium is grooved like a gutter, and in the groove lie five piercing stylets, and a second groove or labrum. It is along this labrum that the blood is sucked. Between the paired lobes of the labium, and guided by them (as a billiard cue may be guided by two fingers), a bundle of five extremely fine stylets sinks slowly through the epidermis, cutting into the skin as easily as a paper-knife into a soft cheese. Four of these stylets are toothed, but the single median one is shaped like a two-edged sword. Along its centre, where it is thickest, runs an extremely minute groove, only visible under a high power of the microscope. Down this groove flows the saliva, charged with the spores or germs of the malaria-causing parasite. Through this minute groove has flowed the fluid which, it is no exaggeration to say, has changed the face of continents and profoundly affected the fate of nations.

It is an interesting fact that, amongst the Culicidæ, it is the female alone that bites, and she is undoubtedly greedy. If undisturbed, she simply gorges herself until every joint of her chitinous armour is stretched to the cracking point. At times even, like Baron Munchausen's horse after his adventure with the Portcullis, what she takes in at one end runs out at the other. But she never ceases sucking. The great majority of individuals, however, can never taste blood, and subsist mainly on vegetable juices.

Anopheles is often conveyed great distances by the wind, or in railway trains or ships; but of itself it does not fly far, about five or six hundred yards—some authorities place it much lower—is its limit. Both Anopheles and Culex lay their eggs, as is well known, in standing water, and here three out of the four stages in their life-history—the egg, the larva, and the pupa—are passed through. The larva and the pupa hang on to the surface-film of the water by means of certain suspensory hairs, and by their breathing apparatus. Anything which prevents the breathing tubes reaching the air ensures the death of the larva and pupa. Hence the use of paraffin on the pools or breeding places. It, or any other oily fluid, spreads as a thin layer over the surface of the pools and puddles, and clogs the respiratory pores, and the larvæ or pupæ soon die of suffocation.

Thus a considerable degree of success has attended the efforts of the sanitary authorities, largely at the instigation of Major Ross, all over the world, to diminish the mosquito-plague. It is, of course, equally important to try and destroy the parasite in man by means of quinine. This is, however, a matter of very great difficulty. In Africa and in the East nearly all native children are infected with malaria, though they suffer little, and gradually acquire a high degree of immunity. Still, they are always a source of infection; and Europeans living in malarious districts should always place their dwellings to the windward of the native settlements.

Another elegant little gnat, *Stegomyia fasciata*, closely allied to Culex, with which, until recently, it was placed, is the cause of the spread of that most fatal of epidemic diseases, the yellow fever. Like the Culex, but unlike the Anopheles, Stegomyia has a humpbacked outline, and its larva has a long respiratory tube at an angle to its body, from which it hangs suspended from the surface-film of its watery home. It is a very widely distributed creature; it girdles the earth between the tropics, and is said to live well on shipboard. It breeds in almost any standing fresh water, provided it be not brackish. The female is said to be most active during the warmer hours of the day, from noon until three or so, and in some of the West Indies it is known as the "day-mosquito."

The organism which causes yellow fever has yet to be found. It seems that it is not a bacterium, and that it lives in the blood of man. It evidently passes through a definite series of changes in the mosquito, for freshly infected mosquitoes do not at once convey the disease. After biting an infected person it takes twelve days for the unknown organism to develop in the Stegomyia, before it is ready for a change of host. The mosquitoes are then capable of inoculating man with the disease for nearly two months. The period during which a man may infect the mosquito, should it bite him, is far shorter, and extends only over the first three days of the illness.

Very careful search has hitherto failed to reveal the presence of the parasite of yellow fever. By its works alone can it be judged. It seems that, like the germ of rinderpest and of foot-and-mouth disease, it is ultra-microscopic; and our highest lenses fail to resolve it.

King Solomon sent to Tarshish for gold and silver, ivory, and apes and peacocks, and, at the present day, people mostly go to Africa for gold, diamonds, ivory, and game. These are the baits that draw them in. Of the great obstacles, however, which have for generations succeeded in keeping that great continent, except at the fringes, comparatively free from immigrants, three, and these by no means the least important, are insignificant members of the order Diptera. We have considered the case of Culex and Anopheles; the third fly we have now to do with is the tsetse fly (Glossina), which communicates fatal diseases to man and to cattle and domesticated animals of all kinds.

The members of the genus Glossina are unattractive insects, a little larger than our common house-fly, with a sober brownish or brownish-grey coloration. When at rest the two wings are completely superimposed, like the blades of a shut pair of scissors; and this feature readily serves to distinguish the genus from that of all other blood-sucking flies, and is of great use in discriminating between the tsetse and the somewhat nearly allied Stomoxys and Hæmatopota.

The tsetse flies rapidly and directly to the object it seeks, and must have a keen sense of smell, or sight, or both, making straight for its prey, and being most persistent in its attacks. The buzzing which it produces when flying is peculiar, and easily recognised again when once heard. After feeding, the fly emits a higher note, a fact recalling the observation of Dr. Nuttall and the present writer on the note of Anopheles, in which animal we observed that "the larger the meal the higher the note." The tsetse does not settle lightly and imperceptibly on the sufferer as the Culicidæ do, nor does it alight slowly and circumspectly after the manner of the horse-flies, but it comes down with a bump, square on its legs. Like the mosquito, the tsetse is greedy, and sucks voraciously. The abdomen becomes almost spherical, and of a crimson red, and in the course of a few seconds the fly has exchanged the meagre proportions of a Don Quixote for the ampler circumference of a Sancho Panza. Unlike so many of the blood-sucking Diptera, in which the habit is confined to the females, both sexes of Glossina attack warm-blooded creatures.

The fly always seems to choose a very inaccessible portion of the body to operate on, between the shoulders in man, or on the back and belly in cattle and horses, even inside the nostrils in the latter, or on the forehead in dogs. According to Lieut.-Colonel D. Bruce, R.A.M.C., to whom we owe so much of our knowledge of this fly and its evil work, the female does not lay eggs, but is viviparous, and produces a large active yellow larva, which immediately crawls away to some secluded crevice, and straightway turns into a hard, black pupa, from which the imago emerges in some six weeks. Thus two stages, the egg and the larva, both peculiarly liable to destruction, are practically skipped in the tsetse, at any rate in some species.

The genera of the Culicidæ which we have considered are found practically all over the world, but the genus

Glossina is fortunately confined to Africa. From the admirable map of the geographical distribution of the fly compiled by Mr. Austen, we gather that its northern limit corresponds with a line drawn from the Gambia, through Lake Chad to Somaliland, somewhere about the thirteenth parallel of north latitude. Its southern limit is about on a level with the northern limit of Zululand. The tsetse, of course, is not found everywhere within this area; and, though it has probably escaped observation in many districts, it seems clear that it is very sporadically distributed.

Even where the tsetse is found, it is not uniformly distributed, but occurs in certain localities only. These form the much dreaded "fly-belts." The normal prey of the fly is undoubtedly the big game of Africa. But they are not the only factor in its distribution. The nature of the land also plays a part. There are the usual discrepancies in the accounts of travellers, especially of African travellers, as to the exact localities the Glossina affects; but most writers agree that the tsetse is not found in the open veldt. It must have cover. Warm, moist, steamy hollows, containing water and clothed with forest growth, are the haunts chosen.

The tsetse fly belongs to the family Muscidæ, the true flies, a very large family, which also includes our house-fly, blue-bottle fly, &c. These flies, unlike Anopheles and Culex, are day-flies, and begin to disappear at or about sunset, a fact noted centuries ago by Dante:—

"Nel tempo che colui, che il mondo schiara,
La faccia sua a noi tien meno ascosa,
Come la mosca cede alla zanzara."[1]

The practical disappearance as the temperature drops has enabled the South African traveller to traverse the fly-belts with impunity during the cooler hours of the night. At nightfall the tsetse seems to retire to rest amongst the shrubs and undergrowth; but, if the weather be warm, it may sit up late; and some experienced travellers refrain from entering a fly-belt, especially on a summer's night, until the temperature has considerably fallen.

The sickness and death of the cattle bitten by the tsetse were formerly attributed to some specific poison secreted by the fly, and injected during the process of biting. It is now, largely owing to the researches of Colonel Bruce, known to be due to the inoculation of the beasts with a minute parasitic organism conveyed from host to host by the fly. The disease is known as "nagana," and the organism that causes it is a species of Trypanosoma, a flagellate protozoon or unicellular organism, which moves by means of the lashing of a minute, whip-like process. Since Bruce's researches, a number of Trypanosomas have been found causing disease in various parts of the world; thus *T. evansii* causes the surra disease of cattle, horses, and camels in India; *T. equinum* produces the "mal de caderas" of the horse ranches of South America; and *T. equiperdum* is responsible for the North African disease called by the French the dourine; *T. theileri* causes the gall-sickness, and there are others. The particular species of Trypanosoma which causes nagana is *Trypanosoma brucei*, and it does not attack man; goats and donkeys seem also immune; but, with these exceptions, all domesticated animals suffer, and in a great percentage of cases the disease terminates in death. Just as the native children in Africa form the source of the supply of the malarial parasite without appearing to suffer much, so do the big game of the country abound in Trypanosoma without appearing to be any the worse. They are in Lankester's phrase "tolerant" of the parasite, and a harmony between them and the parasite has been established, so that both live together without hurting one another. It is from the big game that the disease has spread. In their bodies the harmful effect of the parasite has, through countless generations, become attenuated; but it leaps into full activity again as soon as the Trypanosoma wins its way into the body of any introduced cattle, horse, or domesticated animal.

The report of Colonel Bruce, which has just been issued, shows that the sleeping sickness which devastates Central Africa, from the west coast to the east, is also conveyed by a species of tsetse fly. Writing more than a hundred years ago of Sierra Leone, Winterbottom mentions the disease. "The Africans," he says, "are very subject to a species of lethargy which they are very much afraid of, as it proves fatal in every instance." Early last century it was recorded in Brazil and the West Indies; and Lankester has suggested that the deaths which our slave-owning ancestors used to attribute to a severe form of home-sickness, or even to a broken heart, were in reality caused by sleeping sickness. In one year the deaths in the region of Busoga reached a total of 20,000; and it is calculated that although the disease was only noticed in Uganda for the first time in 1901, by the middle of 1904 100,000 people had been killed by it. The disease is caused by the presence of a second species of Trypanosoma in the blood and in the cerebro-spinal fluid. The existence of this parasite has now been proved in all the cases recently investigated. Apparently the Trypanosoma can live in the blood without doing much harm, and only when it reaches the cerebro-spinal canal does it set up the sleeping-sickness. It is also found in great numbers in the lymphatic glands, especially those of the neck, which in patients infected by the parasite are usually swollen and tender. From the similarity of the parasite to that causing the cattle disease of South Africa, the idea at once arose that the Trypanosoma was conveyed from man to man by a biting insect. Along the lake shores a species of tsetse (*G. palpalis*) abounds; and it was noticed that if the fly, having fed off a sleeping-sickness patient, bit a monkey, the monkey became infected. Further, flies which were captured in a sleeping-sickness district were also capable of conveying the disease to healthy monkeys. The proof that sleeping sickness is due to a Trypanosoma known as *T. gambiense* present in the cerebro-spinal fluid of the patient, due to the brilliant research of Colonel Bruce and his colleagues, Captain Grieg and Dr. Nabarro, and that it is conveyed from man to man by *Glossina palpalis*, seems now complete.

Finally, we come to a last class of diseases which is of the utmost interest to the agriculturist and settler, and yet at present is but little understood. These diseases are caused by various species of a protozoon named Piroplasma, and the diseases may collectively be spoken of as piroplasmosis. When they are present in cattle they are spoken of in various parts of the world as Texas fever, tick-fever, blackwater, and redwater. Heartwater in sheep is a form of piroplasmosis. Horses also suffer, and the malignant jaundice or bilious fever which makes it impossible to keep dogs in certain parts of this country is also caused by a Piroplasma. Finally, under the name of Rocky Mountain fever, spotted- or tick-fever, the disease attacks man throughout the west half of the United States.

The organisms which cause the disease live for the most part in the red blood corpuscles, but they are sometimes to be found in the plasma or liquid of the blood. Unfortunately we know comparatively little about the life-history of the Piroplasma or of the various stages it passes through, but we do know how it is transmitted from animal to animal and from man to man.

We have seen that the carrier or "go-between" in the case of the malaria is the mosquito, and in the case of the sleeping sickness is the tsetse fly. Piroplasma, however, is not conveyed from host to host by any insect, but by mites or ticks, members of the large group of Acarines, which include beside the mites the spiders, scorpions, harvestmen, and many others.

The ticks differ from the insect bearers of disease, inasmuch as the tick that attacks an ox or a dog does not itself convey the disease, but it lays eggs—for I regret to say here, as with the Anopheles, it is the female only that bites—and from these eggs arises the generation which is infective, and which is capable of spreading the disease. The tick which conveys the Piroplasma from dog to dog is called *Haemophysalis leachi*. The brilliant researches of Mr. Lounsbury have shown that even the young are not immediately capable of giving rise to the disease. The female tick gorges herself with blood, drops to the ground, and begins laying eggs. From these eggs small six-legged larvæ emerge. These larvæ, if they get a chance, attach themselves to a dog, gorge themselves, and after a couple of days fall off. If their mother was infected they nevertheless do not convey the parasite. After lying for a time upon the ground the larval tick casts its skin and becomes

[1] *Inf.* xxvi. 26–28.

a nymph, a stage roughly corresponding with chrysalis of a butterfly. This nymph, if it has luck, again attaches itself to the dog and has a meal, but it also fails to infect the dog. After a varying time it also drops to the ground, undergoes a metamorphosis, and gives rise to the eight-legged adult tick. Here at last we reach the infective stage; the adult tick is alone capable of giving the disease to the animal upon which she feeds, and then only when she is descended from a tick which has bitten an infested host. Think what a life-history this parasite has! Living in the blood-corpuscles of a dog, sucked up by an adult tick, passed through her body until it reaches an egg, laid with that egg, being present while the egg segments and slowly develops into the larva; living quiescent during the larval stage and the nymph stage, surviving the metamorphosis, and only leaping into activity when the adult stage is reached. This most remarkable story probably indicates that the Piroplasma undergoes a series of changes comparable to those of the malaria organism when it is inside the mosquito; what these stages are we do not at present know, but Dr. Nuttall and Mr. Smedley at Cambridge, and many other observers elsewhere, are at work on the problem, and soon we shall have more light.

With regard to bovine piroplasmosis, Koch and others have distinguished redwater fever, which is conveyed by *Rhipicephalus annulatus*, and in Europe probably by *Ixodes reduvius* from the Rhodesian fever which is conveyed by *Rhipicephalus appendiculatus*, and I regret to say by a species dedicated to myself, *Rhipicephalus shipleyi*.[1]

The heartwater disease of sheep and goats is similarly conveyed by *Amblyomma hebraeum*, the Bont tick, and many farmers accuse *Ixodes pilosus* of causing the well known paralysis from which sheep suffer in the early autumn; and there are many others, diseases such as the chicken disease of Brazil, which is so fatal to poultry yards, and which is conveyed by the *Argas persicus*.

I will not weary you with more diseases. I think I have said enough to show that within the last few years a flood of light has been thrown upon diseases, not only of man and his domestic animals, but upon such insignificant creatures as the mosquito and the tick. I have tried to show how these diseases interact, and how both hosts are absolutely essential to the disease. We can now to a great extent control these troubles; the old idea that there is something unhealthy in the climate of the tropics is giving way to the idea that the unhealthiness is due to definite organisms conveyed into man by definite biting insects. We have at last, I think, an explanation of why Beelzebub was called the Lord of Flies.

## UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—Prof. Osler has been nominated by the Vice-Chancellor and Proctors as a delegate of the University Press.

A decree has been approved by Convocation providing that the stipend of the Sibthorpian professor of rural economy shall be 600*l*. a year, independently of the income from the Sibthorpian estate, in the years 1906 and 1907. This is necessary if an election is to be made before 1908, as the full endowment will not be provided by St. John's College until that year. St. John's is to nominate a member of the board of electors to the chair.

The following elections have been made to scholarships and exhibitions in natural science:—Balliol College, to a Brakenbury scholarship, J. S. Huxley (Eton College), to a scholarship, C. Whitley (Bromsgrove School); Lincoln College, to a scholarship, P. Pickford (Exeter School), to an exhibition, E. Hancock (Exeter School); Magdalen College, to a demyship, D. L. Hammick (Whitgift Grammar School, Croydon), to an exhibition, J. F. Venables (Magdalen College School, Oxford); Christ Church, to a scholarship, J. T. Lattey (Dulwich College), to an exhibition, W. A. Akers (Aldenham School); Trinity College, to a Millard scholarship, H. G. J. Moseley (Eton College).

A COURSE of lectures upon modern research in the psychology of memory, accompanied by the exhibition of apparatus, will be given by Dr. C. S. Myers in the physiological theatre of King's College, London, on January 12 and the following seven Fridays at 6 p.m. The course is free to internal students of the university and to all teachers. The general course in experimental psychology, accompanied by laboratory work, will be held on Saturdays, beginning on January 13. Particulars may be obtained from the secretary of the college.

THE *London University Gazette* announces that a course of nine or ten lectures on the origin of Gymnosperms will be given during the Lent term by Prof. F. W. Oliver, F.R.S., at University College on Mondays, commencing on January 22. There is no fee for the lectures. Further details and cards of admission may be obtained on application to the academic registrar at the university. Two courses of lectures have been arranged for the Lent term in the physiological laboratory of the university, viz. eight lectures on tissue-respiration by Mr. J. Barcroft on Tuesdays, beginning on January 16, and eight lectures on respiration by Dr. M. S. Pembrey on Fridays, beginning on January 19.

[1] This happily turns out to be a synonym.

## SOCIETIES AND ACADEMIES.

LONDON.

**Royal Society**, November 23, 1905.—"Some Observations on *Welwitschia mirabilis*, Hooker, f. By Prof. H. H. W. **Pearson.** Communicated by A. C. Seward, F.R.S.

Evidence is adduced in support of the view that Welwitschia is partially, if not entirely, insect-pollinated, and that the processes of fertilisation and maturation of the seed seem to be effected much more rapidly than in other Gymnosperms.

The author supports Strasburger's view that the male flowers are reduced forms of an originally hermaphrodite structure. The nature of the prothallial tubes is discussed, and the conclusion is that the true interpretation of the extraordinary behaviour of the fertile end of the Welwitschia prothallus will be founded upon a comparison with the corresponding portion of the embryo-sac of *Gnetum gnemon*.

December 14, 1905.—"The Araucarieæ, Recent and Extinct." By A. C. **Seward,** F.R.S., and Sibille O. **Ford.**

The work was undertaken primarily with a view to ascertain whether the genera Agathis and Araucaria exhibit any of those features which are often associated with survivals from the past; the aim was to obtain an answer to the question: Do the existing Araucarieæ afford evidence of primitive characters or do they throw light on the phylogeny of the araucarian phylum?

A comparison is made between the Araucarieæ and Lycopodiales; arguments are advanced in favour of the view that this group of Gymnosperms, unlike the Cycadales, was probably derived from lycopodiaceous ancestors. Attention is directed to the various characters in which the Araucarieæ differ from other members of the Coniferales, and the advisability is suggested of giving more definite expression to their somewhat isolated position by substituting the designation Araucariales for Araucarieæ.

The authors contend that the general consent which has deservedly been given to the view that the Cycadales and Filicales are intimately connected by descent may have the effect of inducing an attitude too prone to overestimate the value of the arguments advanced in support of an extension of the idea of a filicinean ancestry to other sections of the Gymnosperms.

"On the Microsporangia of the Pteridosperms." By R. **Kidston,** F.R.S.

The conclusion arrived at is that the Cycadofilices, which long antedated the advent of true ferns, cannot have been derived from them, but are themselves the oldest type of fern-like plant at present known. In regard to the true ferns, it seems probable that they may have been derived from the Botryopterideæ.

"The Mammalian Cerebral Cortex, with Special Reference to its Comparative Histology. I., Order Insectivora." By Dr. G. A. **Watson.** Communicated by Dr. F. W. Mott, F.R.S.